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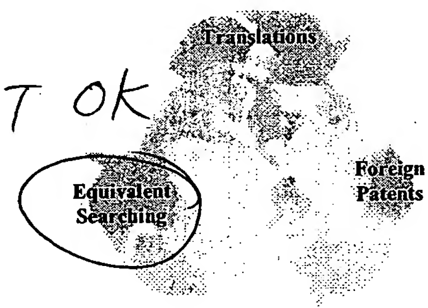

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…ING PITCH MEASURING APPARATUS, …DING PITCH MEASURING METHOD AND …RTABLE INFORMATION TERMINAL USING THEM

TECHNICAL FIELD

[0001] The present invention relates to a fading pitch detection apparatus in a mobile communication system and the method for detecting a fading pitch, and a mobile information terminal using the apparatus and the method.

BACKGROUND ART

[0002] In a mobile communication system, fading means the variations of a reception signal corresponding to changes in the speed of a mobile terminal and a standing wave. Such controls as mentioned below may be achieved based upon the fading pitch thereof. For example, for controlling transmission power, a transmission power control period may be determined based upon the fading pitch. As a result, transmission power may be controlled efficiently to deal with variations in the reception level of the signal caused by the fading.

[0003] Furthermore, in a CDMA (Code Division Multiple Access)-system based communication, a reception symbol is detected by calculating the carrier wave phase by weighting and synthesizing transmission line estimation values obtained from a plurality of pilot symbols. In this case, an optimal weight may be selected based upon the fading pitch.

[0004] Still more, in the CDMA-system based communication, the timing of an incoming path is detected by calculating a correlation between a reception signal and a specific code and then averaging this correlation. In this case, an averaging time, a measurement interval, and the like in the measurement of the correlation may be optimized based upon the fading pitch. As a result, power consumption may be reduced.

[0005] Still further, with a mobile terminal, the moving speed is obtained by the product of a fading pitch multiplied by the wavelength of a carrier wave. Therefore, the moving speed of a terminal may be obtained by detecting the fading pitch, which may contribute to establishing various types of wireless channels.

[0006] As a conventional fading pitch detection apparatus, FIG. 10 shows a first conventional art as an example. FIG. 10 is a block diagram of a conventional fading frequency (pitch) detection apparatus, which is disclosed in Japanese Unexamined Patent Publication [redacted] Referring to the FIG., a reference numeral 51 denotes branches 1 to n for receiving a multiple number of reception waves which may appear to have no correlation to one another. The multiple number of branches 51 correspond to a plurality of antennas, for example. A reference numeral 52 denotes a synthesizing means, which is configured by hybrid circuits, for generating a synthesized reception wave by synthesizing the electric-field strength of a reception wave arriving at the respective branches 51 with a proper phase difference for maintaining the constancy of the distribution of the electric-field strength. With the thus generated synthesized reception wave, the distribution of the electric-field strength is maintained, which is relative to the multiple number of reception waves. In addition to that, all the fading accompanying those reception waves are multiplexed, so that a seeming fading pitch becomes higher than the fading pitch of an actually arriving reception wave.

[0007] A reference numeral 53 denotes a measuring means for obtaining a fading pitch by calculating the number of times per unit time the fading occurs with the synthesized reception wave. A reference numeral 54 denotes a conversion means for calculating the fading pitch of a reception wave actually arriving at the respective branches 51 by multiplying the obtained fading pitch by a predetermined numeric value. The predetermined numeric value is the ratio of the fading pitch of the synthesized reception wave to the fading pitch of the reception wave arriving at one of the branches. The predetermined numeric value is obtained through actual measurement or simulation based upon the wireless transmission line model of the reception wave.

[0008] According to this conventional art, a fading pitch is measured of a synthesized reception wave having a higher frequency in having the fading occurred than an actual reception wave arriving at the respective branches. Then, the fading pitch measured is used for calculating the fading pitch of an actually arriving reception wave at the respective branches 51. AS a result, a fading pitch may be measured accurately in a short time.

[0009] Furthermore, as another conventional fading pitch detection apparatus, FIG. 11 shows a second conventional art as an example. FIG. 11 is a block diagram of a conventional fading pitch detection apparatus disclosed in Japanese Unexamined Patent Publication [redacted] Referring to the FIG., a reference numeral 61 denotes a radio section for receiving a radio wave. A reference numeral 62 denotes a level detection section for detecting the reception level of the reception signal based upon a timing signal generated in a given cycle. Then, a sampling is performed in an A/D (analog/digital) converter 63 by converting a detected reception level into a digital value. A reference numeral 64 denotes a storage section for holding previously sampled reception signals for each sampling. A reference numeral 65 denotes a difference detection section for calculating a difference between a currently sampled reception level and the previously sampled reception level for each sampling. A reference numeral 66 denotes an accumulating section for obtaining an accumulated value by accumulating the differences successively received for a given period of time.

[0010] It is already known that there is a correlation between this accumulated value and a fading pitch. Thus, a correlation table between the fading pitch and the accumulated value is provided previously through experiments. A reference numeral 67 denotes a fading pitch detecting section for converting the accumulated value obtained in the accumulating section 66 into a fading pitch by means of the previously provided correlation table.

[0011] According to this conventional art, the accumulated value is obtained by accumulating the differences for a given period of time. For that reason, the accumulated value delicately changes according to the value of a difference. As a result, a high-precision fading pitch may be detected.

[0012] According to the first conventional fading pitch detection apparatus, the plurality of branches is required for receiving reception waves which may appear to have no correlation to one another. However, the plurality of

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L10: Entry 2 of 2 File: DWPI Mar 22, 1996

DERWENT-ACC-NO: 1996-215234
DERWENT-WEEK: 199623

TITLE: Fading pitch estimation device for mobile communication system - uses estimation part to estimate fading part based on integrated value

PATENT-ASSIGNEE: FUJITSU LTD (FUIT), NTT IDO TSUSHINMO KK (NITE)

PRIORITY-DATA: 1994JP-0212553 (September 6, 1994)

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PATENT-FAMILY:

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JP 08079161 A	March 22, 1996		012	H04B007/26

APPLICATION-DATA:

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JP 08079161A	September 6, 1994	1994JP-0212553	

INT-CL (IPC): H04 B 7/26; H04 L 1/02

ABSTRACTED-PUB-NO: JP 08079161A
BASIC-ABSTRACT:

The device includes a sampling part (1) which samples the receiving level of the received signal to a predetermined period. A calculation part (2) computes the difference between each sampled receiving level. Each computed difference is integrated at a predetermined time and an addition value is calculated by an addition circuit (3). A pitch estimation part (4) estimates a fading pitch based on the integrated value.

ADVANTAGE - Improves detection accuracy. Raises quality of service control.

ABSTRACTED-PUB-NO: JP 08079161A
EQUIVALENT-ABSTRACTS:

CHOSEN-DRAWING: Dwg.1/16

DERWENT-CLASS: W02
EPI-CODES: W02-C03C3A; W02-C05A;

PATENT ABSTRACTS OF JAPAN

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(51)Int.CI. H04B 7/26
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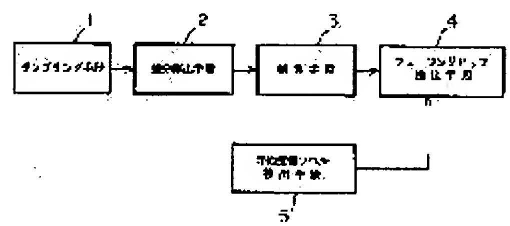
(71)Applicant : **FUJITSU LTD**
N T T IDO TSUSHINMO KK

(72)Inventor : **OBUCHI KAZUCHIKA**
NAKAMURA TAKAHARU
KAWABATA KAZUO
SUDA KENJI
TAKAMI TADAO

(54) FADING PITCH ESTIMATION DEVICE

(57)Abstract:
PURPOSE: To provide a fading pitch estimation device which can improve its detection accuracy of the fading pitch in a mobile communication system.
CONSTITUTION: A sampling means 1 samples the receiving levels of received signals in each prescribed cycle, and a difference calculation means 2 calculates the difference between the sampled receiving levels. An integration means 3 integrates the calculated differences in a prescribed period of time to obtain the integration value. It is already known that the integration value of differences calculated between those sampled receiving levels has the correlation with the fading pitch value. Thus a fading pitch estimation means 4 converts the integration value into a fading pitch based on the correlation. As this integration value sensitively changes in response to the value of the preceding difference, the detection accuracy of the fading pitch is improved compared with the conventional method that is insensitive to the difference value.



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CLAIMS

[Claim(s)]
[Claim 1] a sampling means sample the receiving level of an input signal a predetermined period in the phasing pitch presumption equipment in migration communication system, and a calculus-of-finite-differences appearance means compute the difference between each of said sampled receiving level -- said -- it was computed -- each -- the phasing pitch presumption equipment characterized by to have an addition means integrate difference [predetermined time], and a phasing pitch presumption means presume a phasing pitch based on said integrated value.
[Claim 2] it was computed with said calculus-of-finite-differences appearance means -- each -- phasing pitch presumption equipment according to claim 1 characterized by having further a comparison means to send only difference beyond said predetermined threshold for difference to said addition means as compared with a predetermined threshold.
[Claim 3] Said calculus-of-finite-differences appearance means is phasing pitch presumption equipment according to claim 1 which will be characterized by computing difference of said two receiving level if said two receiving level is said more than predetermined level predetermined level / respectively] about two receiving level continuously sampled with said sampling means.
[Claim 4] Said calculus-of-finite-differences appearance means is phasing pitch presumption equipment according to claim 1 which will be characterized by computing difference of said two receiving level if one [at least] receiving level of the two receiving level continuously sampled with said sampling means is more than predetermined level.
[Claim 5] It is phasing pitch presumption equipment according to claim 1 which has further an average receiving level detection means detect average receiving level of said receiving level, and carries out [presuming a phasing pitch based on average receiving level detected with an addition value from which said phasing pitch presumption means was acquired with said addition means, and said average receiving level detection means, and] as the feature.
[Claim 6] It is phasing pitch presumption equipment according to claim 5 characterized by detecting said average receiving level only using receiving level detected immediately after an antenna change based on [have further a receiver which adopted an antenna selection diversity system, and] said antenna selection diversity system in said average receiving level detection means.
[Claim 7] Phasing pitch presumption equipment in migration communication system characterized by providing the following A sampling means to sample receiving level of an input signal a predetermined period A calculus-of-finite-differences appearance means to compute difference of said two receiving level if one [at least] receiving level of the two receiving level continuously sampled with said sampling means is more than predetermined level said -- it was computed -- each -- a comparison means to output a driving signal for difference as compared with a predetermined threshold at the time beyond said predetermined threshold A count means for said driving signal to be inputted and to count the number of inputs of said driving signal [predetermined time], and a phasing pitch presumption means to presume a phasing pitch based on a value which said count means counted [said predetermined time]
[Claim 8] Said calculus-of-finite-differences appearance means is phasing pitch presumption equipment according to claim 7 which will be characterized by computing difference of said two receiving level if said two receiving level is said more than predetermined level predetermined level / respectively] about two receiving level continuously sampled with said sampling means.
[Claim 9] Phasing pitch presumption equipment in migration communication system characterized by providing the following A sampling means to sample receiving level of an input signal a predetermined period A calculus-of-finite-differences appearance means to compute difference of each of said sampled receiving level said -- it was computed -- each -- a comparison means to output a driving signal for difference as compared with a predetermined threshold at the time beyond said predetermined threshold A phasing pitch presumption means presume a phasing pitch based on the average receiving level detected with a count means said driving signal is inputted and count the number of inputs of said driving signal [predetermined time], an average receiving level detection means detect average receiving level of said receiving level, and the value which said count means counted [said predetermined time] and said average receiving level detection means
[Claim 10] It is phasing pitch presumption equipment according to claim 9 characterized by detecting said average receiving level only using receiving level detected immediately after an antenna change based on [have further a receiver which adopted an antenna selection diversity system, and] said antenna selection diversity system in said average receiving level detection means.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the phasing pitch presumption equipment which detects the receiving level variation of an input signal and presumes a phasing pitch especially about the phasing pitch presumption equipment in migration communication system. In addition, a "phasing pitch" means phasing frequency on these specifications.
[0002] In recent years, the need over migration communication system increases and many radio frequencies are inevitably needed. However, there is a limit in the radio frequency which can be used. Then, in order to aim at a deployment of a radio frequency, installation of dynamic channel quota control etc. is considered. In dynamic channel quota control, it is necessary to point out playing a role with the important passing speed information on a call, and to ask for the passing speed of a call, and the passing speed of **************. The passing speed of a mobile station is easily computable by detecting a phasing pitch.
[0003]
[Description of the Prior Art] Conventionally, there is "passing speed detection equipment in migration communication system" (international application number PCT-JP 93-01714) for example, by these people as phasing pitch presumption equipment in migration communication system. In such equipment, as shown in drawing 16 , when a receiver 101 receives a transmitted electric wave, detects the receiving level of the input signal by the level detecting element 102 for every timing signal of the predetermined period T and changes into digital value by A/D converter 103 first, a sampling is performed. the difference which built in storage based on the sampled receiving level -- the difference of the receiving level sampled this time and the receiving level sampled last time is searched for by the detecting element 104 at the time of a ** sampling. A comparator 105 makes it count up this difference to a counter 106 as compared with a threshold, when larger than a threshold. A counter 106 performs this count [predetermined time], and a transducer 107 changes it into a phasing pitch based on that counted value, and changes it into the passing speed of a mobile station further. Beforehand, a transducer 107 obtains experimentally the correlation table between this counted value and a phasing pitch, keeps it, and changes with reference to this. And phasing pitch fd The relation between the passing speed v of a mobile station expressed with the following type is.
[0004] v=fd xlambda (lambda is the wavelength of an input signal)
The passing speed of a mobile station is computed based on this formula.
[0005]
[Problem(s) to be Solved by the Invention] however -- above -- a comparator 105 -- difference -- when larger than a threshold, only one is made to count up the difference called for by the detecting element 104 to a counter 106 as compared with a threshold, for example, 3dBmu, and if the difference is larger than a threshold, only one is made to count up to a counter 106 uniformly That is, even if there 5dBmu Is difference, smaller [than 3dBmu] or the same of the treatment is said of being large. Therefore, there was a trouble that detection precision was low, in the phasing pitch detected with such equipment.
[0006] moreover, difference -- the value of the receiving level which becomes a radical at the time of difference being computed by the detecting element 104 may be very small, and the receiving level in such a case is buried in the noise in many cases. However, since difference was conventionally computed based on such receiving level even when receiving level was very small, there was a trouble that the reliability of the phasing pitch which the computed difference is not necessarily the value which can set reliance, therefore was detected based on such difference was low.
[0007] Furthermore, although the value of a phasing pitch was the same, there was a phenomenon in which the counted value obtained with a counter 106 changed with magnitude of received field strength, and there was a problem that detection precision could not be made high, in the conventional phasing pitch detection which does not take received field strength into consideration.
[0008] This invention is made in view of such a point, and it aims at offering the phasing pitch presumption equipment which aimed at improvement in the detection precision of a phasing pitch.
[0009]
[Means for Solving the Problem] A sampling means 1 to sample receiving level of an input signal a predetermined period as shown in drawing 1 in order to attain the above-mentioned purpose in this invention, A calculus-of-finite-differences appearance means 2 to compute difference between each sampled receiving level, it was computed -- each -- phasing pitch presumption equipment characterized by having an addition means 3 to integrate difference [predetermined time], and a phasing pitch presumption means 4 to presume a phasing pitch based on an integrated value is offered.
[0010] Moreover, the calculus-of-finite-differences appearance means 2 will compute difference of said two receiving level, if receiving level of one [at least] of these is more than predetermined level as compared with predetermined level at least about one side of the two receiving level continuously sampled with the sampling means 1.
[0011] Moreover, it has further an average receiving level detection means 5 to detect average receiving level of receiving level, and the phasing pitch presumption means 4 presumes a phasing pitch based on average receiving level detected with an addition value and the average receiving level detection means 5 which were acquired with the addition means 3.
[0012]
[Function] In the above configurations, the sampling means 1 samples the receiving level of an input signal a predetermined period, and the calculus-of-finite-differences appearance means 2 computes the difference between each sampled receiving level. and the addition means 3 was computed -- each -- difference is integrated [predetermined time] and an addition value is calculated. At the addition value of the

difference covering this predetermined time, it turns out between the values of a phasing pitch that there is a correlation, therefore the phasing pitch presumption means 4 changes an addition value into a phasing pitch based on such a correlation.
[0013] By the way, since this addition value is a value which changes sensitively according to the magnitude of difference, compared with insensible phasing pitch detection, its detection precision improves in magnitude of difference like before.
[0014] Moreover, the calculus-of-finite-differences appearance means 2 compares with predetermined level at least one side of the two receiving level continuously sampled with the sampling means 1. If one [at least] aforementioned receiving level is more than predetermined level by setting this predetermined level as a big value for a while rather than noise level, this receiving level will be accepted to be a significant value, and will compute the difference of said two receiving level for the first time at this time. Thereby, the computed difference serves as a value which can set reliance, therefore its detection precision of a phasing pitch improves. In addition, the technology in comparison with predetermined level can apply this receiving level also to the equipment of the phasing pitch detection by the conventional counted value.
[0015] Moreover, while preparing beforehand two or more correlation tables for every different average receiving level for a phasing pitch presumption means 4, an average receiving level detection means 5 detects average receiving level, the correlation table according to the average receiving level detected with an average receiving level detection means 5 chooses, and the addition value acquired with an addition means 3 changes to a phasing pitch using this correlation table with a phasing pitch presumption means 4. By this, after also taking average receiving level into consideration, a phasing pitch is detected, therefore the detection precision of a phasing pitch improves. In addition, the technology of detecting a phasing pitch after also taking this average receiving level into consideration is applicable also to the equipment of the phasing pitch detection by the conventional counted value.
[0016]
[Example] Hereafter, the example of the phasing pitch presumption equipment of this invention is explained based on a drawing.
[0017] Drawing 2 is the block diagram showing the configuration of the 1st example of this invention. Among drawing, when a receiver 11 receives a transmitted electric wave, detects the receiving level of the input signal based on the timing signal of a predetermined period by the level detecting element 12 and changes into digital value by A/D converter 13, a sampling is performed. the receiving level sampled last time holds for every sampling in the storage section 14 -- having -- coming -- **** -- difference -- a detecting element 15 computes the difference of the receiving level sampled this time and the receiving level sampled last time for every sampling, and outputs to the addition section 16. the addition section 16 is sent one by one -- each -- difference is integrated [predetermined time (for example, 1sec)], and an addition value is calculated. This addition value is explained with reference to drawing 3 and drawing 4 .
[0018] Drawing 3 and drawing 4 are graphs which show a time change of receiving level, and show receiving level when a phasing pitch has the low curve C2 of drawing 4 for receiving level when a phasing pitch has the high curve C1 of drawing 3 . supposing n timing signals of a predetermined period occur between the above-mentioned predetermined time all over drawing -- receiving level -- between predetermined time -- timing t0 and t2 and .. it will be sampled by tn. the area of three square shapes each displayed with a slash all over drawing since the gap of timing is fixed -- each -- being [therefore] proportional to difference, respectively, total of the area of three square shapes each is proportional to the addition value computed in the addition section 16. On the other hand, drawing 3 and drawing 4 show that total of the area of a shadow area becomes large, so that a phasing pitch becomes high. From these things, if an addition value is calculated, it will be said that it is possible to detect a phasing pitch based on this addition value.
[0019] Therefore, beforehand, the correlation table of the value of a phasing pitch and an addition value is obtained by experiment, and the phasing pitch detecting element 17 changes into a phasing pitch the addition value acquired in the addition section 16 using the correlation table. In addition, since this addition value integrates difference [predetermined time], an addition value becomes possible [changing delicately according to the magnitude of difference, therefore detecting a phasing pitch to high degree of accuracy] here.
[0020] Below, the 2nd example of this invention is explained. Drawing 5 is the block diagram showing the configuration of the 2nd example. Since the configuration of the 2nd example is fundamentally [as the configuration of the 1st example] the same, the same sign is given to the same portion, explanation is omitted, and only a different portion is explained.
[0021] the 2nd example -- a comparator 18 -- difference -- from the detecting element 15, the difference of the receiving level sampled this time and the receiving level sampled last time was sent at the time of a ** sampling, and the comparator 18 was sent -- each -- it compares with the threshold to which difference was sent from the threshold output section 19. And only the difference beyond a threshold is sent to the addition section 16. In the addition section 16, the difference sent from the comparator 18 is integrated [predetermined time], and an addition value is calculated.
[0022] Namely, as not all difference is sent to the addition section 16, for example, it is shown in drawing 6 and drawing 7 (it is assumed also in the 2nd example that it is the same receiving level as drawing 3 and drawing 4) As a result of comparing with a threshold, when a phasing pitch is high (It is equivalent to six shadow areas of drawing 6) becomes beyond a threshold, only six difference is sent to the addition section 16, on the other hand, when a phasing pitch is low, (it is equivalent to three shadow areas of drawing 7) becomes beyond a threshold, and only three difference is sent to the addition section 16. Therefore, compared with the 1st example, the difference between an addition value when a phasing pitch is high, and an addition value when a phasing pitch is low appears clearly, and becomes detectable [a phasing pitch with a more high precision].
[0023] Below, the 3rd example of this invention is explained. Drawing 8 is the block diagram showing the configuration of the 3rd example. Since the configuration of the 3rd example is fundamentally [as the configuration of the 1st example] the same, the same sign is given to the same portion, explanation is omitted, and only a different portion is explained.
[0024] the 3rd example -- difference -- the level output section 22 is connected to a detecting element 21 with a leg, and level is supplied with a leg. Level is set as a somewhat larger value than the noise level contained in receiving level with a leg. difference -- actuation of a detecting element 21 is explained with reference to drawing 9 .
[0025] drawing 9 -- difference -- the difference performed by the detecting element 21 -- it is the flow chart which shows the procedure of detection processing. Hereafter, it explains along with the step shown in drawing.
[S1] The timer which measures predetermined time is made to start measurement.
[0026] [S2] The control variable n of this processing is set as 0.
[S3] -- the receiving level sampled by the level detecting element 12 and A/D converter 13 sampling a period T -- difference -- it is sent to a detecting element 21 at the time of a ** sampling.
[0027] [S4] The receiving level R (t+nT) sampled last time is compared with level with a leg. Consequently, with [the receiving level R (t+nT)] level [more than] with a leg, it progresses to step S5, and with level [under] with a leg, it progresses to step S7.
[0028] [S5] Receiving level R {t+(n+1) T} sampled this time is compared with level with a leg. Consequently, with [receiving level R

{t+(n+1) T}] level [more than] with a leg, it progresses to step S6, and with level [under] with a leg, it progresses to step S7.
[0029] [S6] The difference of the receiving level sampled last time and this time is computed, and it sends to the phasing pitch detection processing section 23.
[S7] If the timer value has resulted in predetermined time (for example, 1sec), ends this processing and has not resulted in predetermined time, it progresses to step S8.
[0030] [S8] Only 1 increases a control variable n and it prepares for next calculus-of-finite-differences appearance.
As mentioned above, since the last time and this sampling receiving level with which the calculus-of-finite-differences appearance in step S6 is presented is more than level with a leg, it can consider that both are the significant values with which such receiving level was clearly distinguished from the noise. Since difference is detected based on such receiving level, difference serves as a value which can set reliance.
[0031] The phasing pitch detection processing section 23 consists of the same configuration as the addition section 16 of the 1st example, and the phasing pitch detecting element 17, carries out the same actuation as the case of the 1st example, and realizes detection of a phasing pitch with a more high precision using the difference which can set the reliance which is not confused by the noise.
[0032] in addition, difference -- the difference which the detecting element 21 showed to drawing 9 -- the difference shown in drawing 10 instead of the procedure of detection processing -- it may be made to perform detection processing. drawing 10 -- difference -- other difference which may be performed by the detecting element 21 -- it is the flow chart which shows the procedure of detection processing. In this flow chart, steps S11-S13 and steps S16-S18 are the same as steps S1-S3 of the flow chart of drawing 9 , and steps S6-S8 respectively. Therefore, explanation of the same step is omitted and only different steps S14 and S15 are explained.
[0033] [S14] The receiving level R (t+nT) sampled last time is compared with level with a leg. Consequently, with [the receiving level R (t+nT)] level [more than] with a leg, it progresses to step S16, and with level [under] with a leg, it progresses to step S15.
[0034] [S15] Receiving level R {t+(n+1) T} sampled this time is compared with level with a leg. Consequently, with [receiving level R {t+(n+1) T}] level [more than] with a leg, it progresses to step S16, and with level [under] with a leg, it progresses to step S17.
[0035] namely, this difference -- with [at least one side of the receiving level sampled last time and this time] level [more than] with a leg, he is trying to compute difference in detection processing
[0036] In addition, although the phasing pitch detection processing section 23 explained in the 3rd above-mentioned example as what consists of the same configuration as the addition section 16 of the 1st example, and the phasing pitch detecting element 17, you may make it consist of the conventionally same configuration as the comparator 105 of equipment, a counter 106, and a transducer 107 which shows the phasing pitch detection processing section 23 in drawing 16 instead of this.
[0037] Below, the 4th example of this invention is explained. Drawing 11 is the block diagram showing the configuration of the 4th example. Since the configuration of the 4th example is fundamentally [as the configuration of the 1st example] the same, the same sign is given to the same portion, explanation is omitted, and only a different portion is explained.
[0038] the 4th example -- difference -- the former which a detecting element 25 shows to drawing 16 -- the difference of equipment -- it consists of the same configuration as a detecting element 104 and a comparator 105, the difference of the receiving level sampled this time and the receiving level sampled last time is searched for at the time of a ** sampling, and a driving signal is outputted for this difference to a counter 26 as compared with a predetermined threshold (for example, 3dBmu) at the time beyond a predetermined threshold. A counter 26 counts the number of inputs of a driving signal [predetermined time], and outputs the counted value after the predetermined time to the phasing pitch detecting element 29.
[0039] On the other hand, the sampling value of the receiving level outputted from A/D converter 13 is sent also to an adder unit 27 and the division section 28, equalization of receiving level is performed and average receiving level is sent to the phasing pitch detecting element 29 here.
[0040] Based on two, the case where received field strength is high, and the case of being low, and an experiment, in the phasing pitch detecting element 29, the correlation table of the counted value of a counter 26 and a phasing pitch is created beforehand, and is kept to it.
[0041] Drawing 13 is drawing showing such a correlation table, is a correlation table when a curve C3 has high received field strength, and is a correlation table when a curve C4 has low received field strength.
[0042] Returning to drawing 11 , the phasing pitch detecting element 29 detects a phasing pitch based on the average receiving level sent from the counted value and the division section 28 which were sent from the counter 26. Actuation of the phasing pitch detecting element 29 is explained with reference to drawing 12 .
[0043] Drawing 12 is a flow chart which shows the procedure of the phasing pitch detection processing performed by the phasing pitch detecting element 29. Hereafter, it explains along with a step.
[S21] As compared with predetermined level (for example, 20dBmu), the average receiving level sent from the division section 28 will be progressed to step S22, if average receiving level is more than predetermined level, and if it is under predetermined level, it will progress to step S23.
[0044] [S22] The counted value sent from the counter 26 is changed into a phasing pitch using the curve C3 of drawing 13 which is a correlation table when received field strength is high.
[0045] [S23] The counted value sent from the counter 26 is changed into a phasing pitch using the curve C4 of drawing 13 which is a correlation table when received field strength is low.
[0046] As mentioned above, compared with equipment, the detection precision of a phasing pitch improves conventionally which a phasing pitch is detected after also taking average receiving level into consideration, therefore changes counted value into a phasing pitch uniformly not related at received field strength.
[0047] In addition, although only two are preparing the correlation table in the 4th above-mentioned example, you may make it prepare three or more correlation tables according to received field strength. Thereby, it is expectable that the detection precision of a phasing pitch improves more.
[0048] moreover, the difference of the 4th above-mentioned example -- a detecting element 25 and a counter 26 -- the storage section 14 of the 1st example, and difference -- it is made the same configuration as a detecting element 15 and the addition section 16, and you may make it the phasing pitch detecting element 29 change an addition value into a phasing pitch, after also taking average receiving level into consideration
[0049] Below, the 5th example of this invention is explained. The 5th example adds a device to the calculation method of the average receiving level of the 4th example. Drawing 14 is the block diagram showing the configuration of the 5th example. Since the configuration of the 5th example is fundamentally [as the configuration of the 4th example] the same, the same sign is given to the same portion, explanation is omitted, and only a different portion is explained.
[0050] In the 5th example, while a timer 30 and the switch 31 driven with this timer 30 are newly formed, an antenna selection diversity

system is adopted as a receiver 32. In a receiver 32, the antenna which received the highest signal of receiving level among the same signals received with two or more antennas is chosen, and actual reception is performed through the antenna. Selection of such an antenna is performed every 6.6ms for every frame of an input signal. A timer 30 is for outputting an ON signal after slight predetermined time amount from the change time, when an antenna change is performed by the receiver 32, a switch 31 flows through it, when an ON signal is sent, and it sends only the receiving level outputted from A/D converter 13 immediately after an ON signal input to an adder unit 27.

[0051] That is, when an antenna change is performed by the receiver 32, the receiving level sampled by the 1st time immediately after the change is naturally quite high level, and, moreover, does not almost have the difference which originates in the value at the height of a phasing pitch. More generally than the receiving level sampled by the 1st time the receiving level sampled by the following time [2nd] of the falls, and, moreover, the degree of the fall becomes so large that a phasing pitch is high. Therefore, the phenomenon in which average receiving level becomes low occurs, so that a phasing pitch is high even when such receiving level is equalized, and it should be essentially set to the same average receiving level. Then, in forming a timer 30 and a switch 31 and computing average receiving level, he is trying for the average receiving level computed in an adder unit 27 and the division section 28 not to be influenced by the height of a phasing pitch in the 5th example, as only the receiving level sampled by the 1st time immediately after an antenna change is used.

[0052] In addition, if the point that the calculation methods of average receiving level differ is removed, actuation of the 5th example is the same as the 4th example. It is possible those two or to combine each above three examples. It is expectable to raise the detection precision of a phasing pitch more with this. The 6th example shown in drawing 15 does so, is one example of combination and combines the 1st, 3rd, and 4th example.

[0053] In addition, although a phasing pitch is only detected, the multiplication of the wavelength of an input signal is further carried out to the detected phasing pitch, and you may make it compute to the passing speed of a mobile station also in which above example.

[0054]

[Effect of the Invention] As explained above, in this invention, the addition value of the amount of fluctuation of receiving level (difference) is calculated, and a phasing pitch is presumed, after computing difference and taking [**** / presuming a phasing pitch from the addition value] average receiving level into consideration using a noise and the significant receiving level whose distinction is possible. It became possible for this to become possible to detect a phasing pitch with a sufficient precision, to be able to perform exact presumption of the passing speed of the mobile station which is an important parameter in migration communication system, consequently to raise the quality of wireless line control or service control.

[Translation done.]

DESCRIPTION OF DRAWINGS

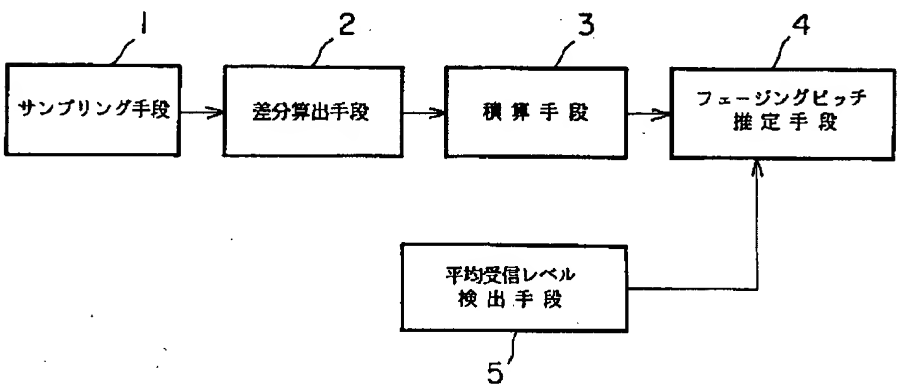
[Brief Description of the Drawings]
[Drawing 1] It is principle explanatory drawing of this invention.
[Drawing 2] It is the block diagram showing the configuration of the 1st example.
[Drawing 3] It is a graph showing the temporal response of receiving level when a phasing pitch is high.
[Drawing 4] It is a graph showing the temporal response of receiving level when a phasing pitch is low.
[Drawing 5] It is the block diagram showing the configuration of the 2nd example.
[Drawing 6] It is a graph showing the temporal response of receiving level when a phasing pitch is high.
[Drawing 7] It is a graph showing the temporal response of receiving level when a phasing pitch is low.
[Drawing 8] It is the block diagram showing the configuration of the 3rd example.
[Drawing 9] difference -- it is the flow chart which shows the procedure of detection processing.
[Drawing 10] other difference -- it is the flow chart which shows the procedure of detection processing.
[Drawing 11] It is the block diagram showing the configuration of the 4th example.
[Drawing 12] It is the flow chart of phasing pitch detection processing.
[Drawing 13] It is drawing showing a correlation table.
[Drawing 14] It is the block diagram showing the configuration of the 5th example.
[Drawing 15] It is the block diagram showing the configuration of the 6th example.
[Drawing 16] It is the block diagram showing the configuration of equipment conventionally.
[Description of Notations]
1 Sampling Means
2 Calculus-of-Finite-Differences Appearance Means
3 Addition Means
4 Phasing Pitch Presumption Means
5 Average Receiving Level Detection Means

[Translation done.]

DRAWINGS

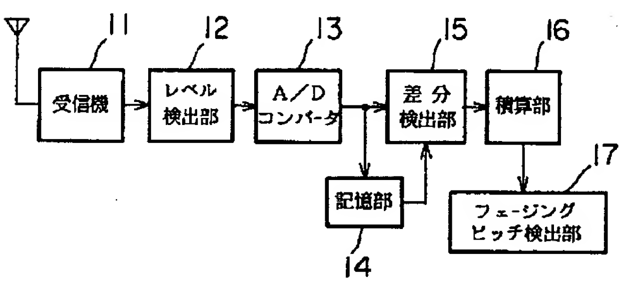
[Drawing 1]

本発明の原理説明図



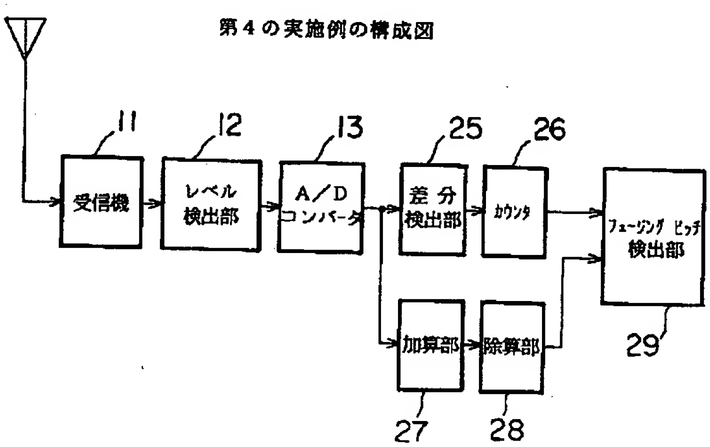
[Drawing 2]

第１の実施例の構成図



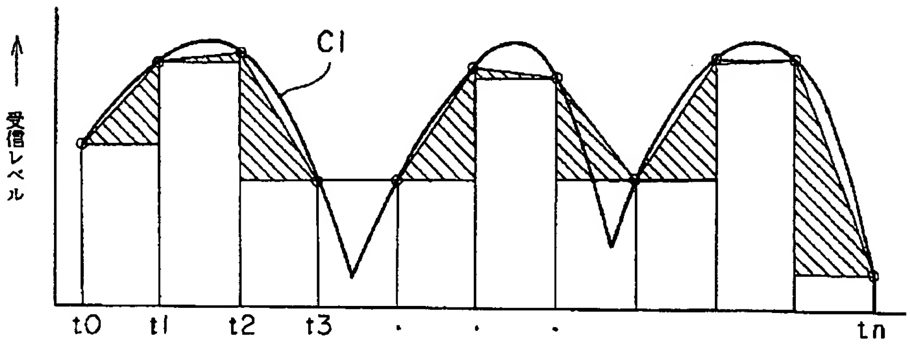
[Drawing 11]

第４の実施例の構成図



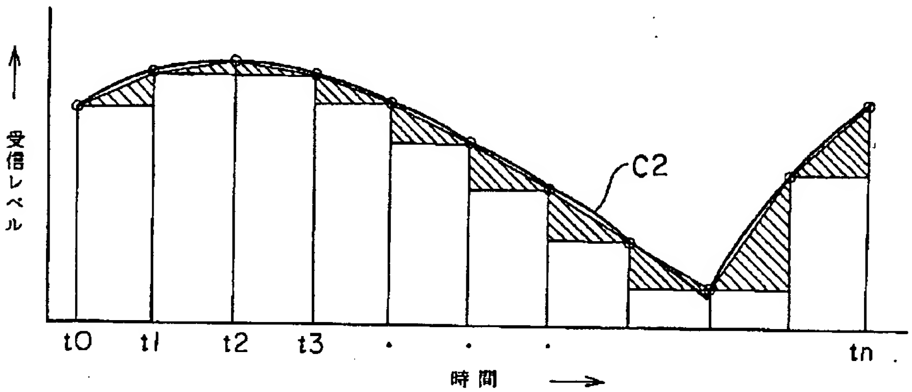
[Drawing 3]

フェージングピッチの高い場合の受信レベルの変化図



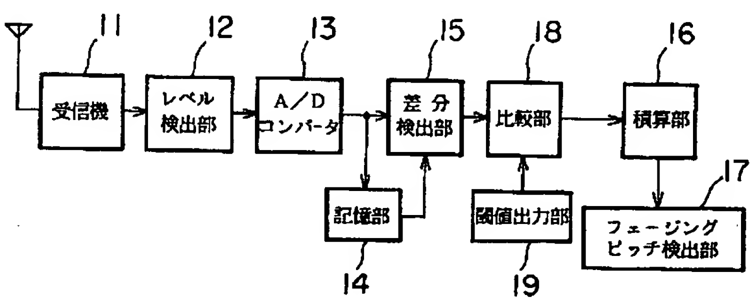
[Drawing 4]

フェージングピッチの低い場合の受信レベルの変化図



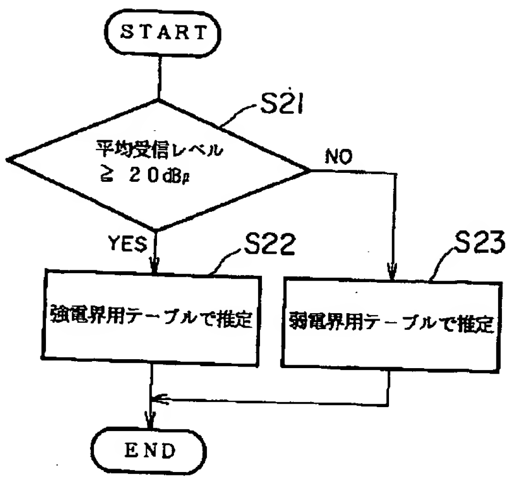
[Drawing 5]

第2の実施例の構成図



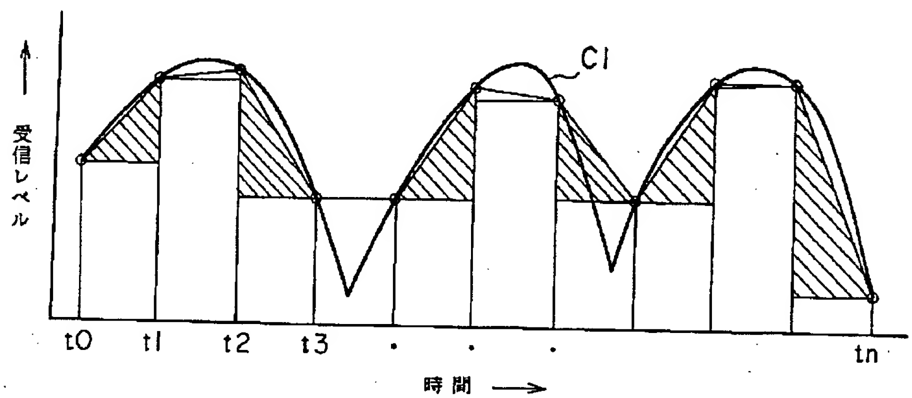
[Drawing 12]

フェージングピッチ検出処理のフローチャート



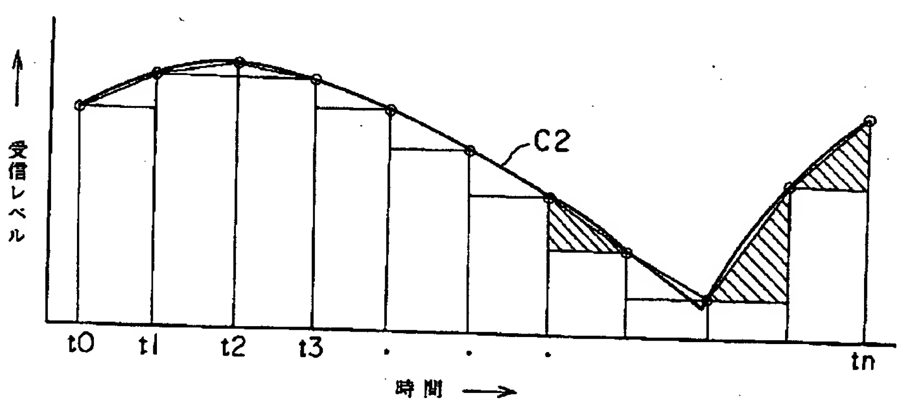
[Drawing 6]

フェージングピッチの高い場合の受信レベルの変化図



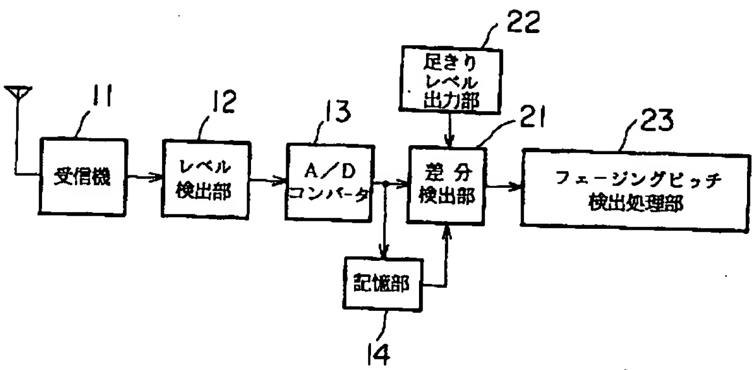
[Drawing 7]

フェージングピッチの低い場合の受信レベルの変化図



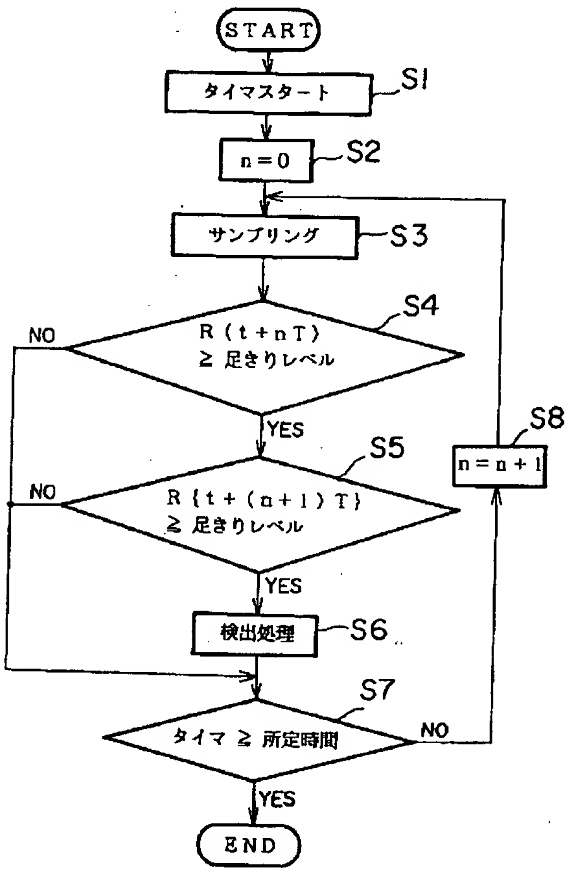
[Drawing 8]

第３の実施例の構成図



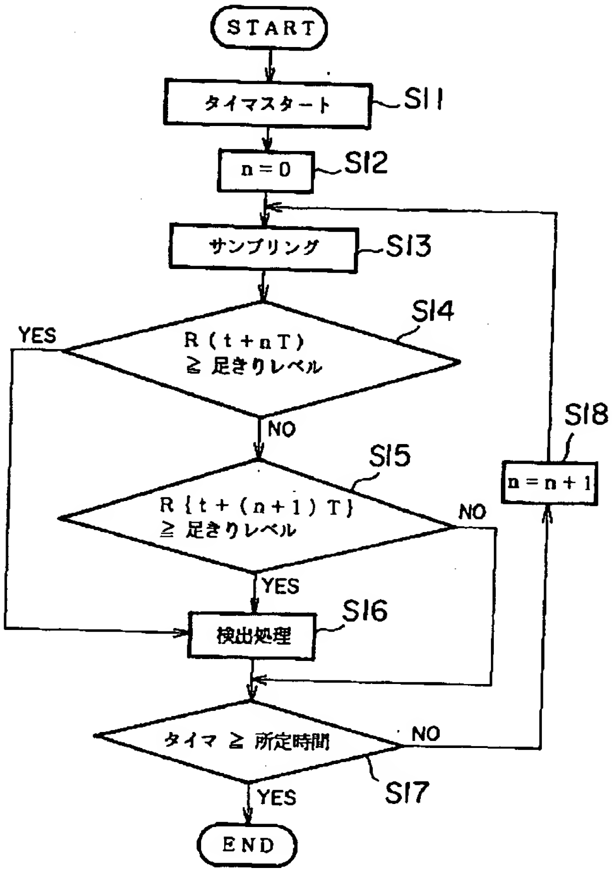
[Drawing 9]

差分検出処理の手順を示すフローチャート



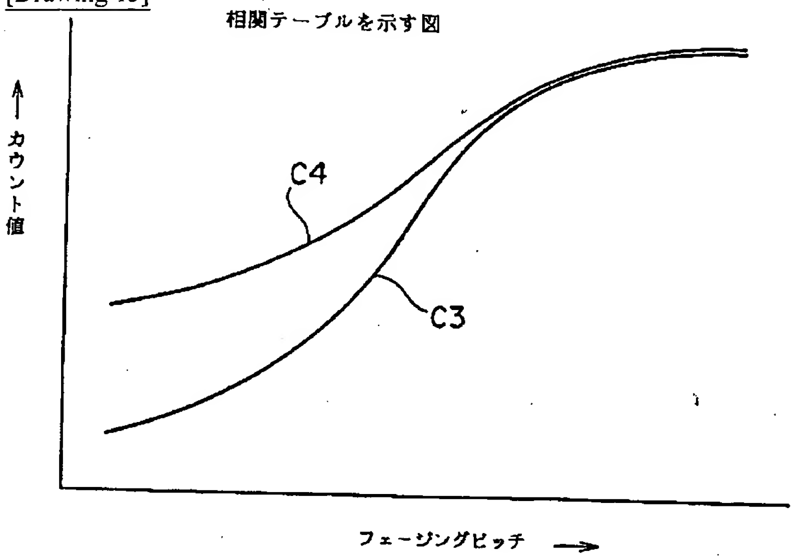
[Drawing 10]

他の差分検出処理の手順を示すフローチャート



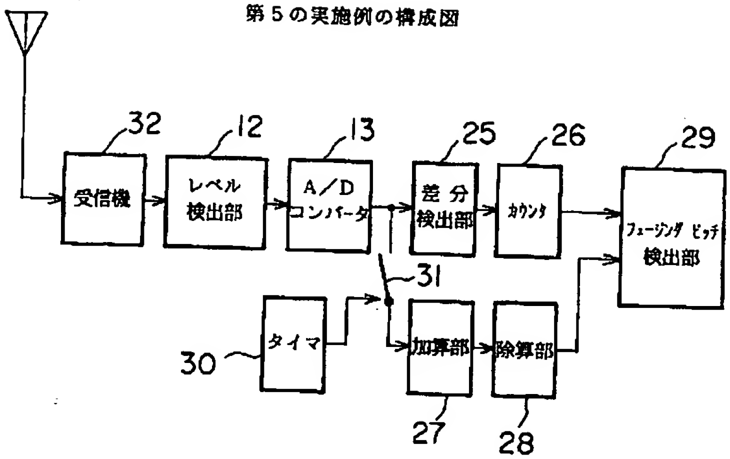
[Drawing 13]

相関テーブルを示す図



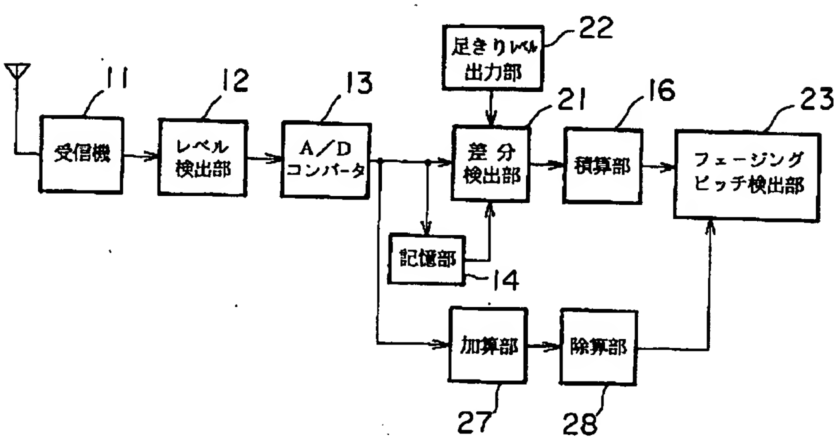
[Drawing 14]

第5の実施例の構成図



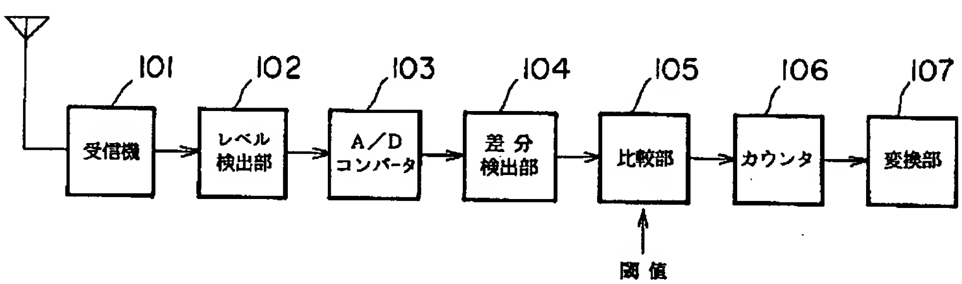
[Drawing 15]

第8の実施例の構成図



[Drawing 16]

従来装置の構成図



[Translation done.]